WHAT IS CLAIMED IS

1. A semiconductor device comprising:

a porous low-k dielectric film formed on a substrate;

an opening portion for wiring formed in the porous low-k dielectric film;

dielectric films cover only side surfaces of the opening portion, each of the dielectric films having dielectric constant of 3 or less; and

a wiring formed in the opening portion through the dielectric film.

2. The semiconductor device according to claim 1, wherein the dielectric films include a fluorinated polyarylene film or an amorphous carbon fluoride.

3. The semiconductor device according to claim 1, wherein the porous low-k dielectric film includes any one of a porous MSQ, a porous HSQ, a hybrid film containing both methyl and hydroxyl groups, and a porous organic film containing carbon as a major component.

4. A method for manufacturing a semiconductor device comprising the steps of:

forming a porous low-k dielectric film on a substrate;

forming an opening portion for wiring in the porous low-k dielectric film;

forming a dielectric film having a dielectric constant of 3 or less on an entire surface of the substrate including side surfaces of the opening portion;

removing unnecessary dielectric film formed on the area other than the side surfaces of the opening portion; and

forming, after the step of removing unnecessary dielectric film, a conductive film in the opening portion through the dielectric film.

5. The method for manufacturing a semiconductor device according to claim 4, wherein the dielectric film includes a fluorinated polyarylene film or an amorphous carbon fluoride.

6. The method for manufacturing a semiconductor device according to claim 4, wherein the porous low-k dielectric film includes any one of a porous MSQ, a porous HSQ, a hybrid film containing both methyl and hydroxyl groups, and a porous organic film containing carbon as a major component.